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FUJITSU MICROELECTRONICS
SUPPORT SYSTEM

SS01-71109-1E

DSU-FR EMULATOR

PGA-401P ADAPTER TYPE 2

MB2198-130-E

OPERATION MANUAL

FUJITSU

PREFACE

Thank you for purchasing the DSU-FR emulator PGA-401P adapter type 2 (MB2198-130-E).
The MB2198-130-E is a development support tool for performing evaluations of application products that use a FUJITSU MICROELECTRONICS FR family microcontroller*.
This document is for engineers developing FUJITSU MICROELECTRONICS FR family microcontroller application products using the MB2198-130-E (referred to as the “adapter” in this manual), and describes the functionality and handling of the adapter and the configuration methods. Read this manual thoroughly before using the adapter.

* : FR, the abbreviation of FUJITSU RISC controller, is a line of products of FUJITSU MICROELECTRONICS LIMITED.

■ Using the product safely

This document contains important information for using this product safely. Be sure to read this manual before using the adapter, and to follow the directions given in this manual in order to use the product correctly.
In particular, thoroughly read the "■ Caution of the product described in this manual" at the start of this document and section "7. Cautions", and perform a thorough safety check before using the product.
Store this document in a safe location where it can easily be accessed at any time while you are using the product.

■ Warranty and liability disclaimers

The specifications of the product are subject to change without notice.
FUJITSU MICROELECTRONICS assumes no liability for any loss or damage whatsoever directly or indirectly arising out of the use of the product.

■ Product operating environment

Use the product at an operating temperature of between +5 °C and +35 °C and at an operating humidity of between 20% to 80%. Avoid using it in a hot or humid environment and prevent condensation.
The product is a frameless PC board unit with all electronic components exposed. Therefore, do not put anything on the product, do not touch or let an electrically charged material contact a metal part of it. Once the product has been powered, try to keep those objects away from it which may short-circuit it or easily catch fire and burn. Use the product as horizontal as possible and avoid operating it at a place exposed to strong vibration, dust, or explosive gas.
Note that using the product not in the above operating environment may unexpectedly cause personal injury to the user (or another person if present near the product) or physical damage to properties around the product.
You should also keep the packaging materials used for shipping the product. They work well as they are when you transport the product again, for example, if it becomes out of order and needs to be repaired.

■ Related manuals

You should refer to the following manuals as well:

- Evaluation MCU hardware manual or datasheet
- Header operation manual
- DSU-FR EMULATOR MB2198-01-E OPERATION MANUAL
- SOFTUNE Workbench OPERATION MANUAL
- SOFTUNE Workbench USER’S MANUAL

■ European RoHS compliance

Products with a -E suffix on the part number are European RoHS compliant products.

■ Notice on this document

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■ **Caution of the product described in this manual**

The following precautions apply to the product described in this manual.

⚠ WARNING	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.

Electric shock, Damage	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
Electric shock, Damage	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.

⚠ CAUTION	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to loose software resources and other properties such as data, if the device is not used appropriately.

Cuts, Damage	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
Cuts	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
Damage	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
Damage	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
Damage	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
Damage	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
Damage	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
Damage	Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.
Damage	Because the structure of the MCU socket does not allow an evaluation MCU to be mounted in the incorrect orientation, be very careful of the orientation of the evaluation MCU when mounting it. Inserting the evaluation MCU in the wrong orientation may damage the MCU, causing the MCU to become faulty.
Damage	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

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1. Overview

This product is a development support tool for developing and evaluating hardware and software that uses the FUJITSU MICROELECTRONICS FR family microcontroller.

■ Overview

It is used with the DSU-FR emulator header*1 to connect the user system corresponding to the FUJITSU MICROELECTRONICS FR family microcontroller and the DSU-FR emulator (MB2198-01-E)*2.

*1 : Referred to as the “header” in this document.

*2 : Referred to as the “emulator” in this document.

The main features of this product are as follows.

- The adapter consists of an adapter board and flat cables (2 sets of the Standard and Long types).
- The adapter board has an on-board IC socket for evaluation MCU (401-pin PGA package code: PGA-401C-A02).
- Connected to the header using a flat cable (standard or long one)
- Used in combination with the header to connect the emulator and the user system
- Power to the adapter is supplied from the user system via the emulator or header.
- Supports the internal ROM emulation memory function.
- Supports the external memory emulation function.
- Supports the external trace function.
- Supports the power-on debug function.

■ Checking the items packaged

Check that the package contains all of the following items before using the product.

- Adapter board: 1
- Flat cables (Standard: 8cm): 2
- Flat cables (Long: 20cm): 2
- Operation manual (Japanese version): 1
- Operation manual (English version: this document):

Note : Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

■ Optional parts

The optional parts for this product are shown in Table 1. Purchase them as required.

Table 1 Optional parts

Name	Part number
Evaluation MCU	FUJITSU MICROELECTRONICS FR family microcontroller (MB91Vxxx)*1
DSU-FR emulator	MB2198-01-E*2
DSU-FR emulator header	MB2198-XXX-E*3
DSU-FR emulator memory board*4	–
Oscillator*5, Capacitor*5	–

*1 : The package code of the evaluation MCU is PGA-401C-A02. If you do not know the type and package code of the evaluation MCU that can be used for this product, contact the sales or support representative.

*2 : Debugger software and communications cables need to be purchased in order to use the emulator.
If you are unsure of the details, contact the sales or support representative.

*3 : The header is an interface board used to connect the user system to the emulator.
Select and purchase the suitable header for the mass production MCU to be used.
See the header operation manual for handling and using headers and precautions of safe use.

*4 : The memory board is required to use the external-memory emulation function (under planning).

*5 : See the data sheet of evaluation MCU for details on the frequency of the oscillator to use.
Furthermore, see the data sheet of the oscillator for details on the values of the capacitors to connect to the oscillator.

2. System Configuration

Used in combination with the header, the adapter is connected to the emulator and the user system.

■ System configuration

Figure 1 shows the system configuration for the adapter.

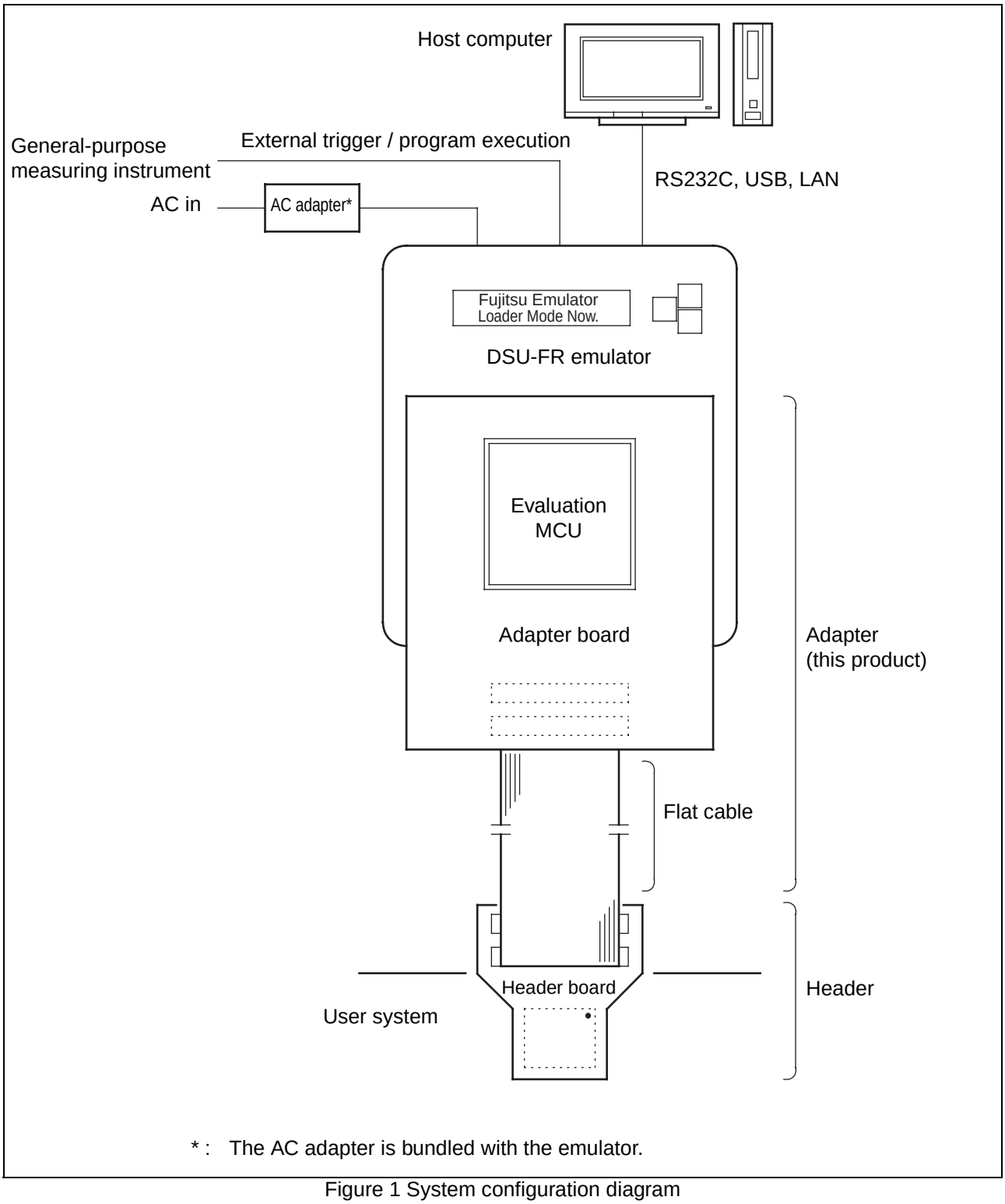


Figure 1 System configuration diagram

See the operation manual of the emulator for details on connecting the emulator to the host computer and general-purpose measuring instrument.
In order to use the emulator, a host computer and emulator debugging software need to be purchased separately. See the operation manual of the emulator for the emulator specifications.

■ Appearance and part names

Figure 2 gives an external view of the adapter board to identify each part of it.
The adapter board illustrated in Figure 2 is in the factory default states.

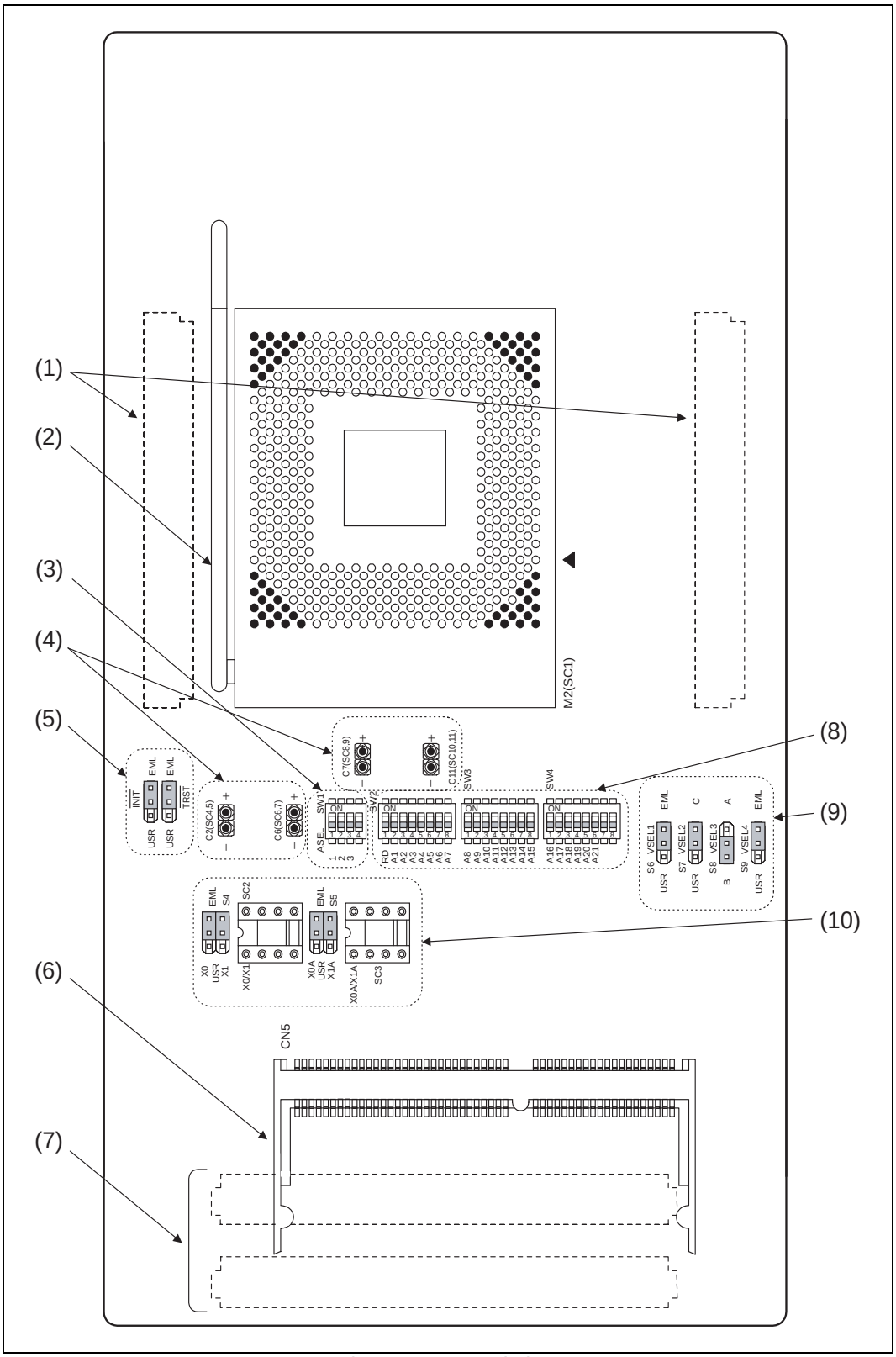


Figure 2 External view

(1) Emulator connector

This connector accepts the emulator (Mounted on the rear side).

(2) IC socket for evaluation MCU

401-pin PGA IC socket for mounting an evaluation MCU

(3) Memory size selection switch

This switch sets the capacity of the memory board to use external-memory emulation.

(4) DVCC bypass capacitor sockets

These sockets accept bypass capacitors to be inserted between DVCC and GND pins.

(5) Reset signal setting jumper plugs

These jumper plugs are used to set the reset signal supply source.

(6) Memory board connector

This connector accepts a memory board (for external-memory emulation).

(7) Flat cable connectors

Use the flat cable packaged in this product, and connect to the header or user system.

(8) Memory connection switches

If the external memory emulation function is being used, these switches connect the I/O ports of the evaluation MCU to the external memory emulation lines.

(9) Jumper plugs for setting the evaluation MCU power supply

These jumper plugs are used to make settings for the evaluation MCU.

(10) Clock input IC sockets and clock input select jumper plugs

The IC sockets accept an oscillator and a capacitor for the main clock and sub clock; the jumper plugs are used to set the clock supply source.

3. Specifications

■ General specifications

Table 2 lists the general specifications of the adapter.

Table 2 General specifications

Item	Specification	
Name	DSU-FR emulator PGA-401P adapter type 2	
Part number	MB2198-130-E	
Power supplies	Evaluation MCU: Internal power supply*	0 V to +5.5 V (UVcc)
	Evaluation MCU: I/O power supply*	0 V to +5.5 V (UVcc)
	Adapter board power supply	+3.3 V (Supplied from emulator)
Internal operating frequency of MCU	Max: 34MHz	
Temperature	Operation: 5 °C to 35 °C Storage: 0 °C to 70 °C	
Humidity	Operation: 20% to 80% (No condensation) Storage: 20% to 80% (No condensation)	
External dimensions	(W) 205mm × (D) 110mm × (H) 30mm (Including the IC socket and connector dimensions)	
Weight	173g	

* : For details on the internal power supply and I/O power supply of each evaluation MCU, see the power supply specifications of the evaluation MCU. For details on each of the power supplies, see the "Evaluation MCU hardware manual" or contact the sales or support representative if you are unsure.

Note : Operating the device outside the range of any general specification may cause the device to malfunction. Use the device in the ranges of its general specifications.

■ Function specifications

Table 3 lists the major function specifications of the adapter.

Table 3 Adapter function specifications

Item	Description	
Adapter function	Used in combination with the DSU-FR emulator and header, it functions as the adapter for connecting the emulator to the evaluation MCU and user system.	
External trace memory	Supports the external trace function. Trace length of 64K frames.	
Internal ROM emulation	Supports the internal ROM emulation memory function. 1Mbyte max.	
External memory emulation	Supports the external memory emulation*1 function. Can be configured as RAM or ROM, and the memory capacity is selectable. This function is implemented by mounting an optional memory board on the adapter board.	
	Memory capacity select	The capacity of the memory board can be selected from among seven steps between 2M words and 32K words (1 word = 16 bits).
	Memory connection	Address lines that are disabled by the memory capacity selection function are able to be disconnected from the buffers and used as user resources instead. Furthermore, even when the external memory emulation function is not being used, the load associated with using the address lines as user resources can be reduced by disconnecting the lines.
Power-on debugging	Supports the power-on debug function*2 which runs a program immediately after the power-on sequence of the evaluation MCU.	
Jumper plugs	The jumper plugs on the adapter board can be used to make various settings of the adapter.	
Clock input IC sockets	The adapter has IC sockets for using oscillators to supply clock signals from the adapter to the main clock (X0/X1) and sub clock (X0A/X1A) pins of the evaluation MCU.	

*1 : The evaluation MCU must support the external-memory emulation feature. The total amount of memory available depends on the memory capacity of the memory board, the memory capacity selection switches, and the settings of the evaluation MCU. Before using this function, see the “Evaluation MCU hardware manual” or contact the sales or support representative if you are unsure. For details, see Section 6.4 "Setting the External Memory Emulation" Note also that this function is added to the external bus of the evaluation MCU. Before using the function, read “7. Cautions” carefully.

*2 : This function assumes that the evaluation MCU supports the power-on debug feature. Before using the function, see the “Evaluation MCU hardware manual” or contact the sales or support representative if you are unsure.

■ Connector and socket specifications

Table 4 lists the specifications of the connectors and IC sockets mounted on the adapter board.

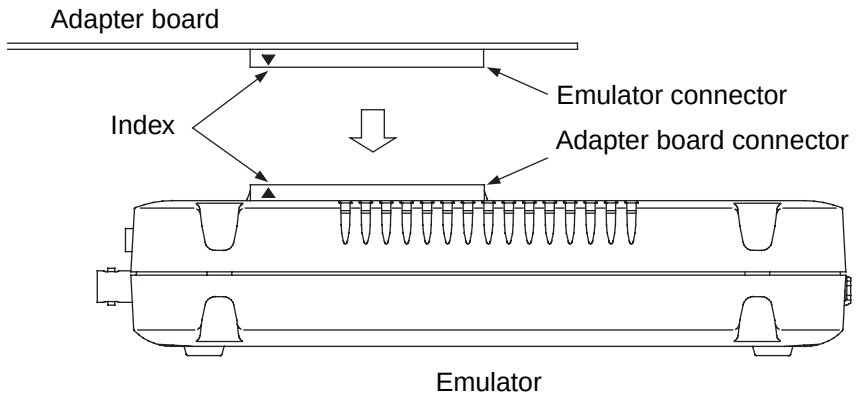
Table 4 Connector and IC socket specifications

Item	Description
Emulator connector	Use this connector to connect the emulator to the adapter. For connecting the emulator, see Section 4 "Connection ■ Connecting the adapter board to the emulator".
Flat cable connectors	Connect the adapter to the header using flat cables coming with the adapter. For connecting the flat cable, see Section 4 "Connection ■ Connecting the adapter board to the header board".
Evaluation MCU mounting IC socket	Mount the evaluation MCU (PGA-401P package). For mounting the evaluation MCU, see Section 5.1 "Installing the Evaluation MCU".
Memory board connector	Mount an optional memory board. For mounting the memory board, see Section 5.2 "Installing the Memory Board".
Oscillator IC sockets	Mount an oscillator and a capacitor authorized for the oscillator. For mounting the oscillator and capacitor, see Section 6.2 "Setting the Clock Supply Circuit".
DVCC bypass capacitor mounting sockets	If the evaluation MCU has an integrated digital power supply (such as a DVCC power supply), a bypass capacitor can be mounted on the digital power supply as required. For mounting the bypass capacitor, see Section 5.3 "Installing a Bypass Capacitor for DVCC".

4. Connection

■ Connecting the adapter board to the emulator

Connect the adapter board to the adapter board connector on the emulator as shown in Figure 3.



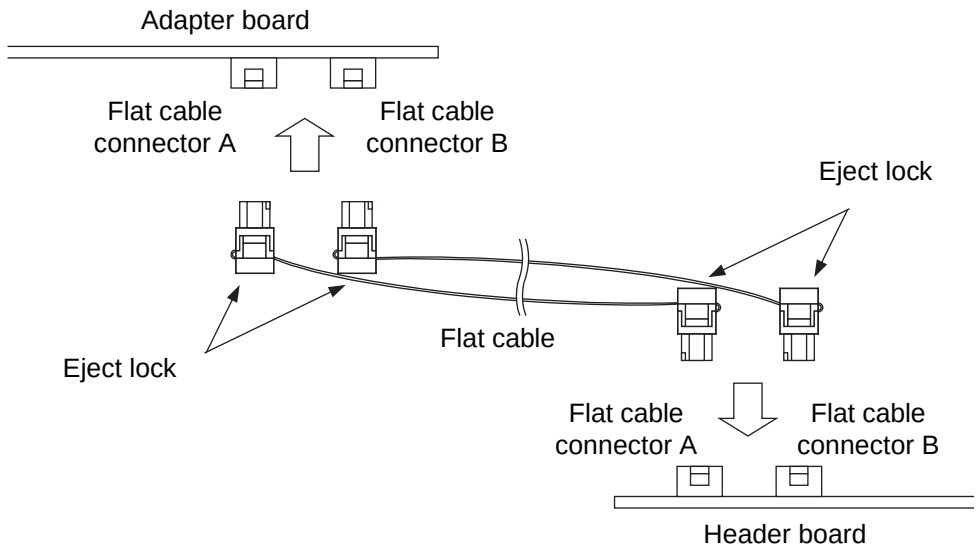
- Insert the connector for connecting the emulator to the adapter board securely to the far end, and align the index (▲) on each connector for prevention of incorrect insertion.
- Apply even force to the connector for removing the adaptor board from the emulator.

Figure 3 Connecting the adapter board to the emulator

Note : Turn power off before board setting/removal.
Apply even force to the connector for unplugging the board.

■ Connecting the adapter board to the header board

Connect the adapter board to the header board using the flat cables that are provided with the adapter, as shown in Figure 4.



- Insert the eject lock units into the flat cable connectors on each of the boards until locked.
- Disconnect the flat cables by pulling out the eject locks of the flat cables and releasing the locks.
- To connect the adapter board and the user system directly, mount the specified connector on the user system confirming Item 8. “User Interface”.

Figure 4 Connecting the adapter board with the header board

Note : Before plugging or unplugging the cable, turn off the power supply.
When unplugging the cable, remove it while holding the case connector without pulling the cable itself.

5. Installation

5.1 Installing the Evaluation MCU

Install the evaluation MCU on the evaluation MCU mounting IC socket on the adapter board as illustrated in Figure 5 to Figure 7. To uninstall the evaluation MCU, follow the instruction illustrated in Figure 8.

■ Installing the evaluation MCU

Open the lever of the evaluation MCU mounting IC socket (SC1) to from the dotted-line position to the solid-line position.

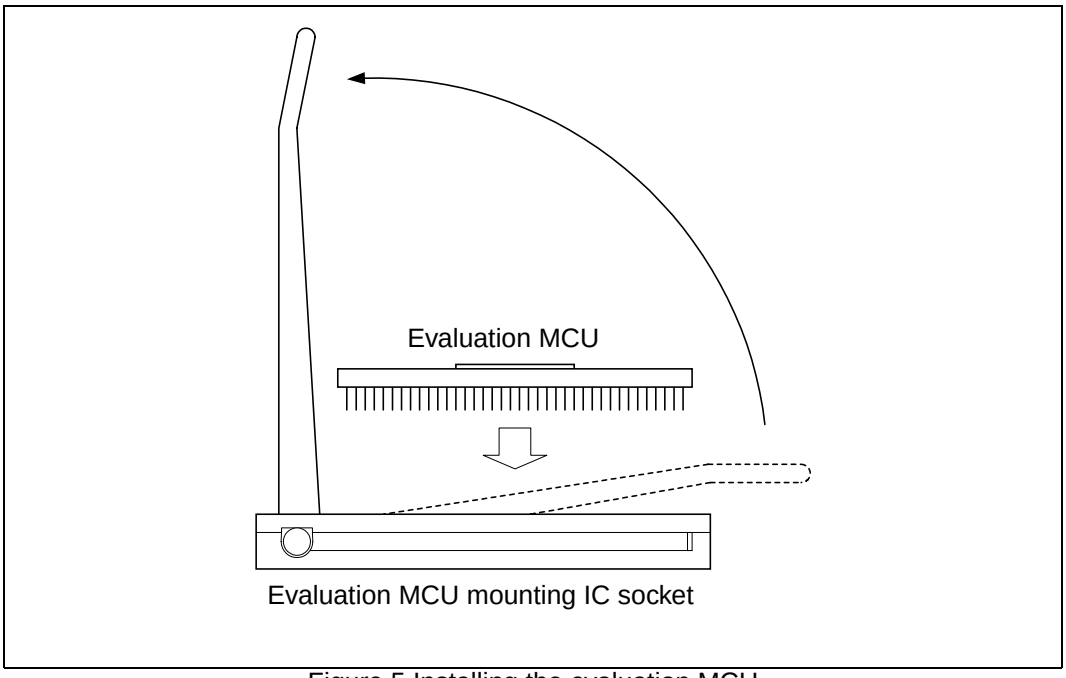


Figure 5 Installing the evaluation MCU

■ Mounting position

Align pin No. 1 of the evaluation MCU with its pin hole in the evaluation MCU mounting IC socket (SC1) and insert the evaluation MCU horizontally (check by looking from the above angle).

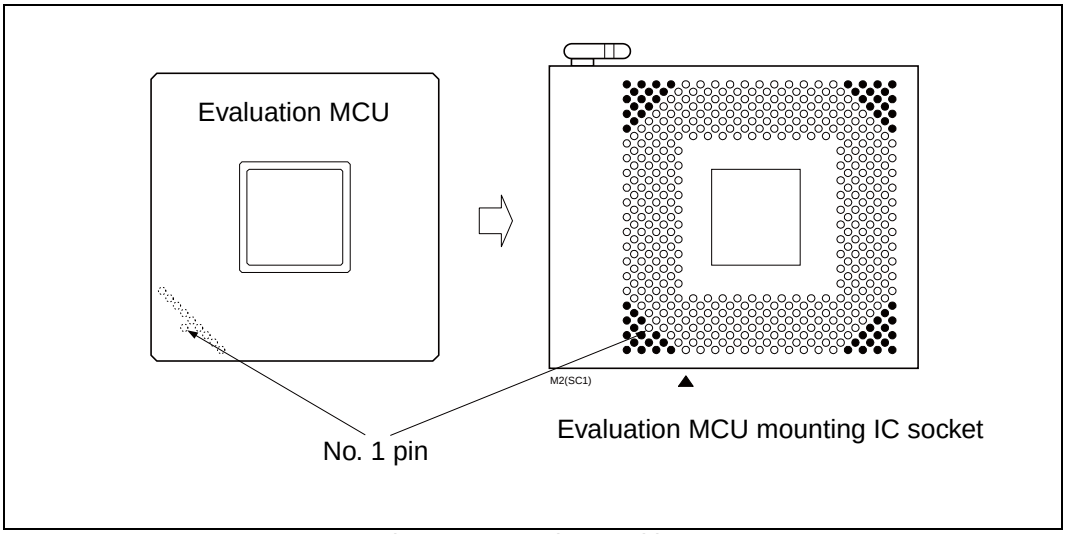


Figure 6 Mounting position

■ Securing the evaluation MCU

Close the lever of the evaluation MCU mounting IC socket (SC1) from the dotted-line position to the solid-line position to lock the evaluation MCU.

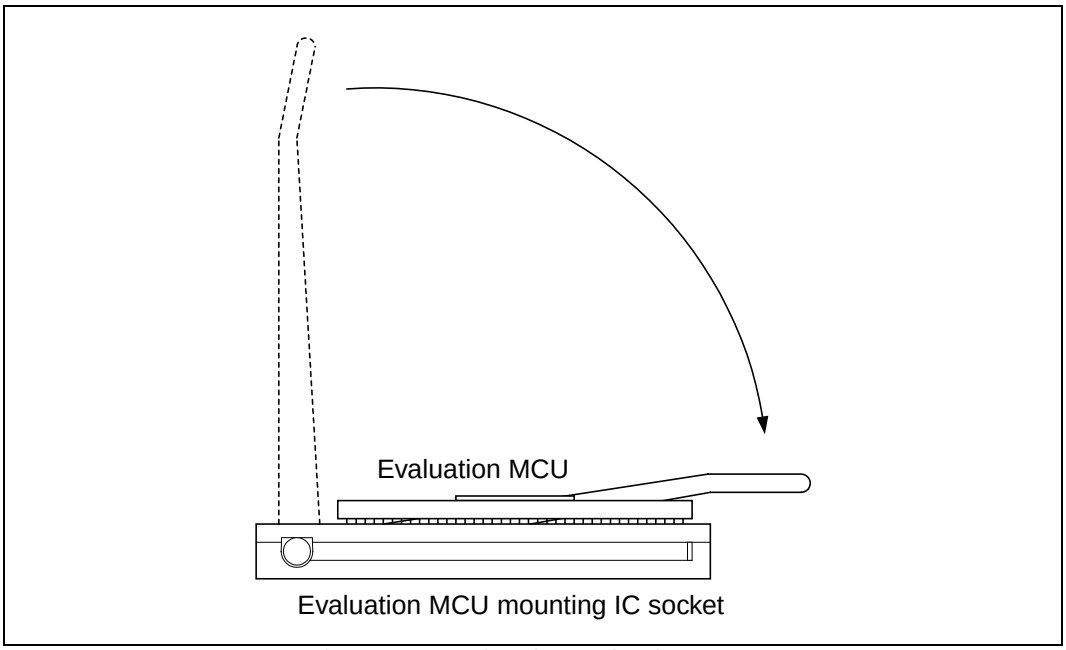


Figure 7 Securing the evaluation MCU

■ Removing the evaluation MCU

To removing the evaluation MCU, open the lever of the evaluation MCU mounting IC socket (SC1) from the dotted-line position to the solid-line position, then remove the evaluation MCU.

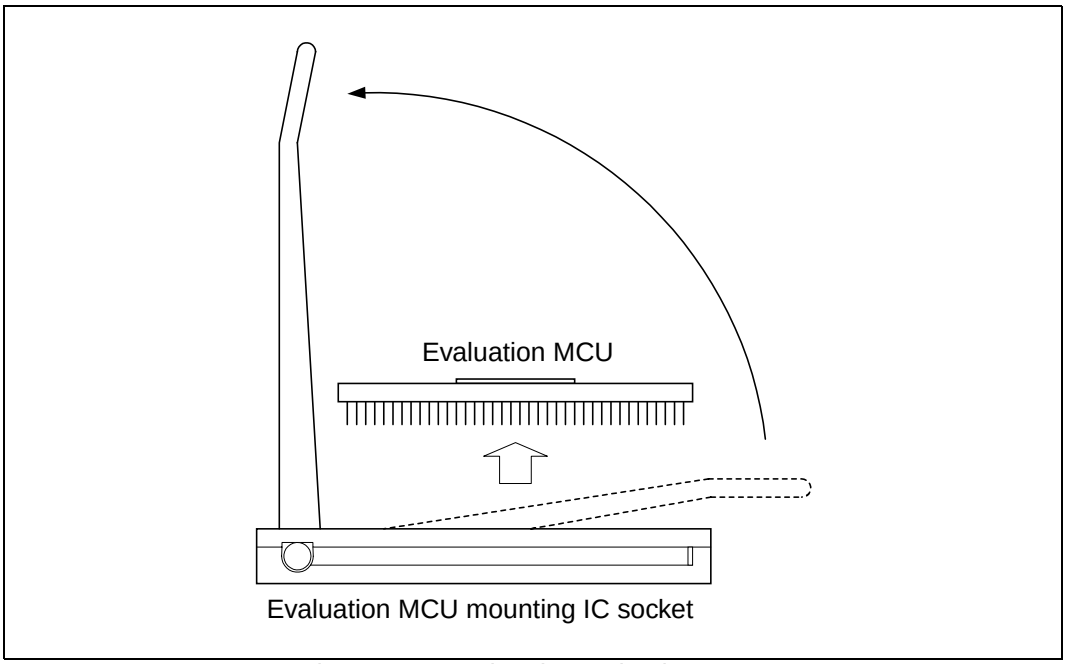


Figure 8 Removing the evaluation MCU

5.2 Installing the Memory Board

When using the external memory emulation function, install an optional memory board into the memory board connector on the adapter board as illustrated in Figure 9 to Figure 11. To uninstall the memory board, follow the instruction illustrated in Figure 12.

■ Mounting position

Align the notch on the memory board with the key of the memory board connector.

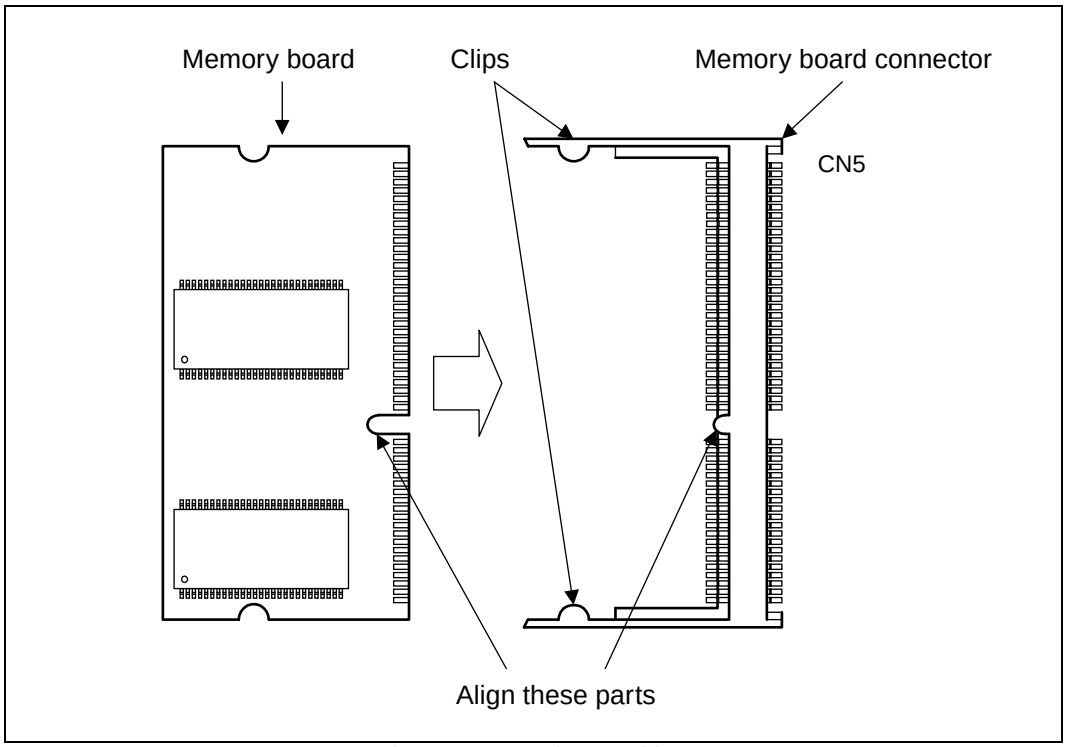


Figure 9 Mounting position

■ Inserting the memory board

Insert the memory board into the memory board connector at an angle as shown in Figure 10 (check by looking from the side).

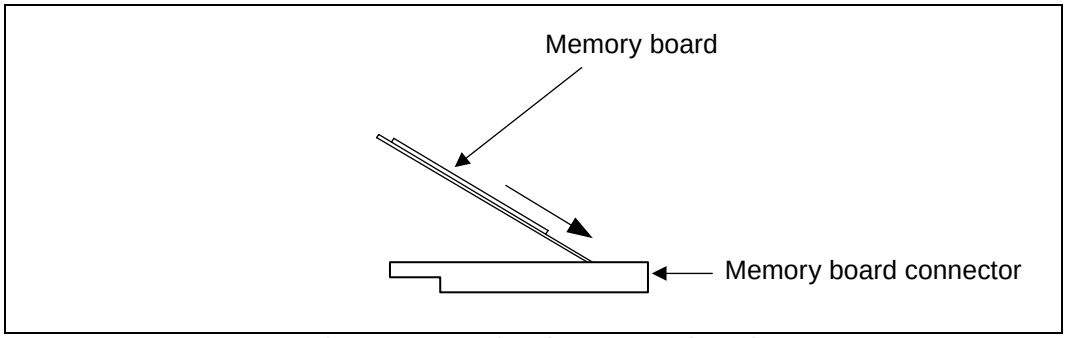


Figure 10 Inserting the memory board

■ Securing the memory board

Put the memory board down from the dotted-line position to the solid-line position and hold the memory board between the clips on both sides until it clicks into place to lock it.

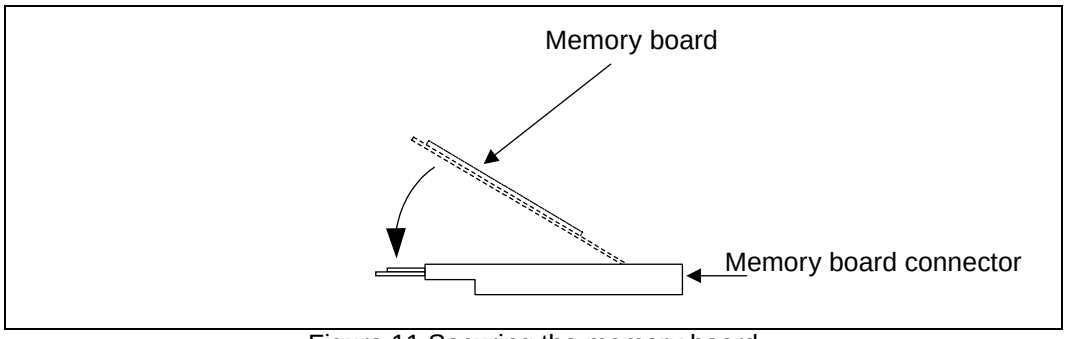


Figure 11 Securing the memory board

■ Removing the memory board

To remove the memory board, open the clips on both sides of the memory board connector by pushing them outward (as shown in the left-side sketch in Figure 12).
Pull the memory board up from the dotted-line position to the solid-line position to remove it (as shown in the right-side sketch in Figure 12).

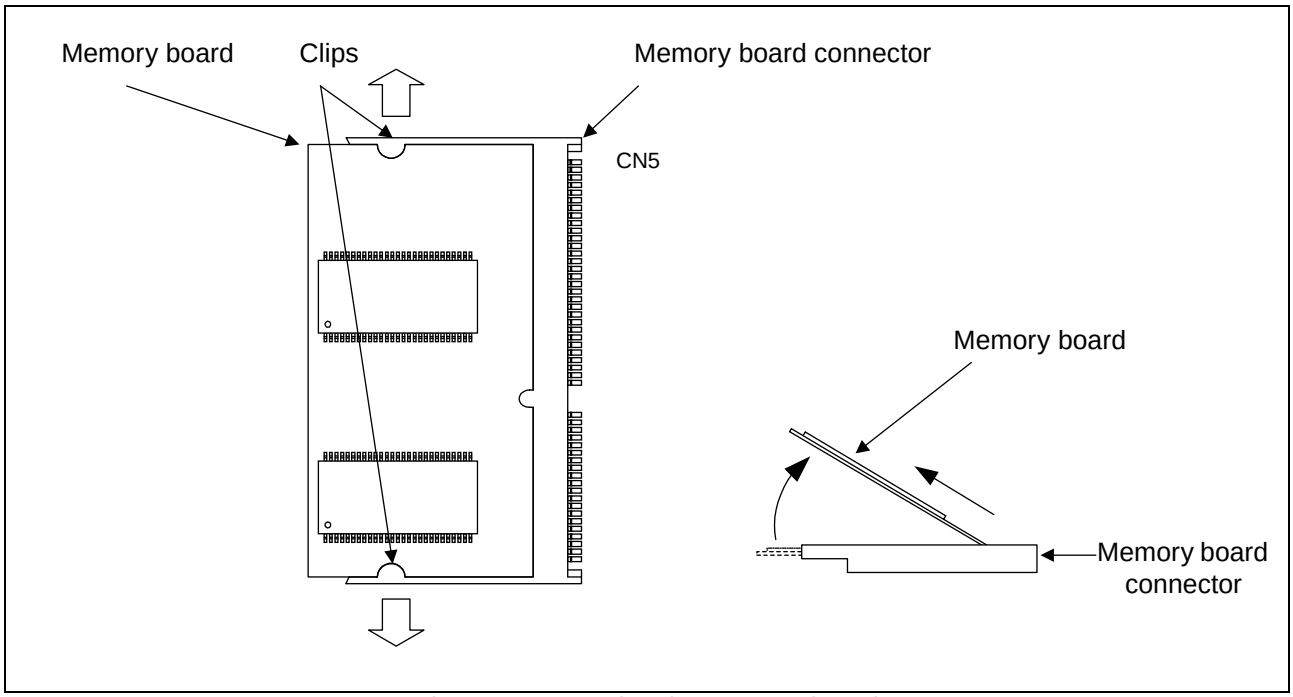


Figure 12 Removing the memory board

5.3 Installing a Bypass Capacitor for DVCC

If the evaluation MCU has an integrated digital power supply (DVCC pin), a bypass capacitor can be mounted on the digital power supply as required.When it does not have a digital power supply (DVCC pin) in Evaluation MCU, a bypass capacitor does not need to be mounted.

■ Installing a bypass capacitor

To use a polarized capacitor such as an electrolytic capacitor as the bypass capacitor, install it according to the polarity defined by the silk pattern on the PC board. Use meticulous care to check the polarity.

Select the appropriate capacitor so that its type, capacitance, and withstand voltage are best suited for the operating environment.

Figure 13 shows how to install the capacitor. Table 5 lists the signal names of digital power supply pins of the evaluation MCU plugged in each capacitor mounting socket.

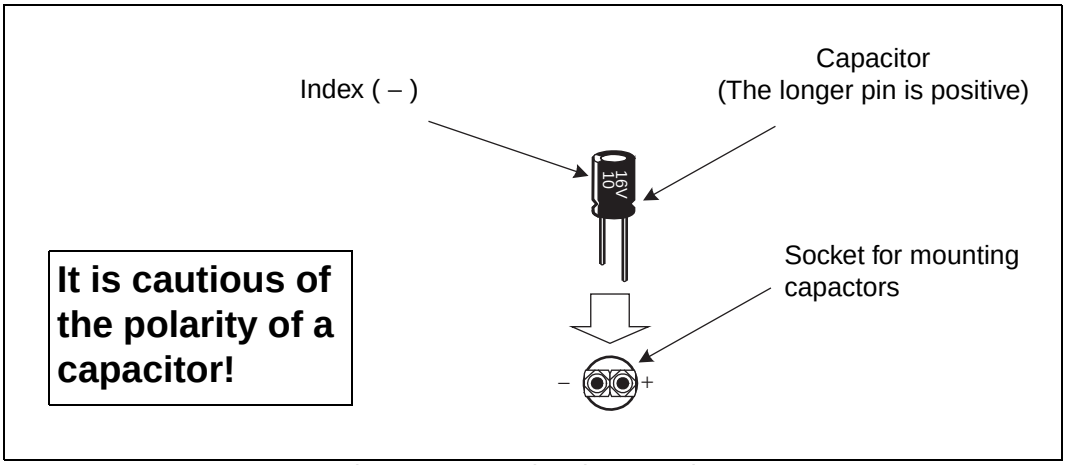


Figure 13 Mounting the capacitor

Table 5 The signal names of digital power supply pins of the evaluation MCU

Capacitor mounting socket name	Correspondence signal line	Evaluation MCU pin number
SC4, SC5	PF2	127
SC6, SC7	PD3	241
SC8, SC9	P85	36
SC10, SC11	P65	39

6. Setting Procedures

6.1 Setting up the Evaluation MCU Power Supply

Figure 14 shows the power supply circuit configuration of evaluation MCU, Figure 15 shows the factory settings of the jumper plugs of evaluation MCU power supply, and Table 6 shows the evaluation MCU power supply specifications according to the settings of each jumper plug from VSEL1 to VSEL4.

■ **Power supply circuit configuration of evaluation MCU**

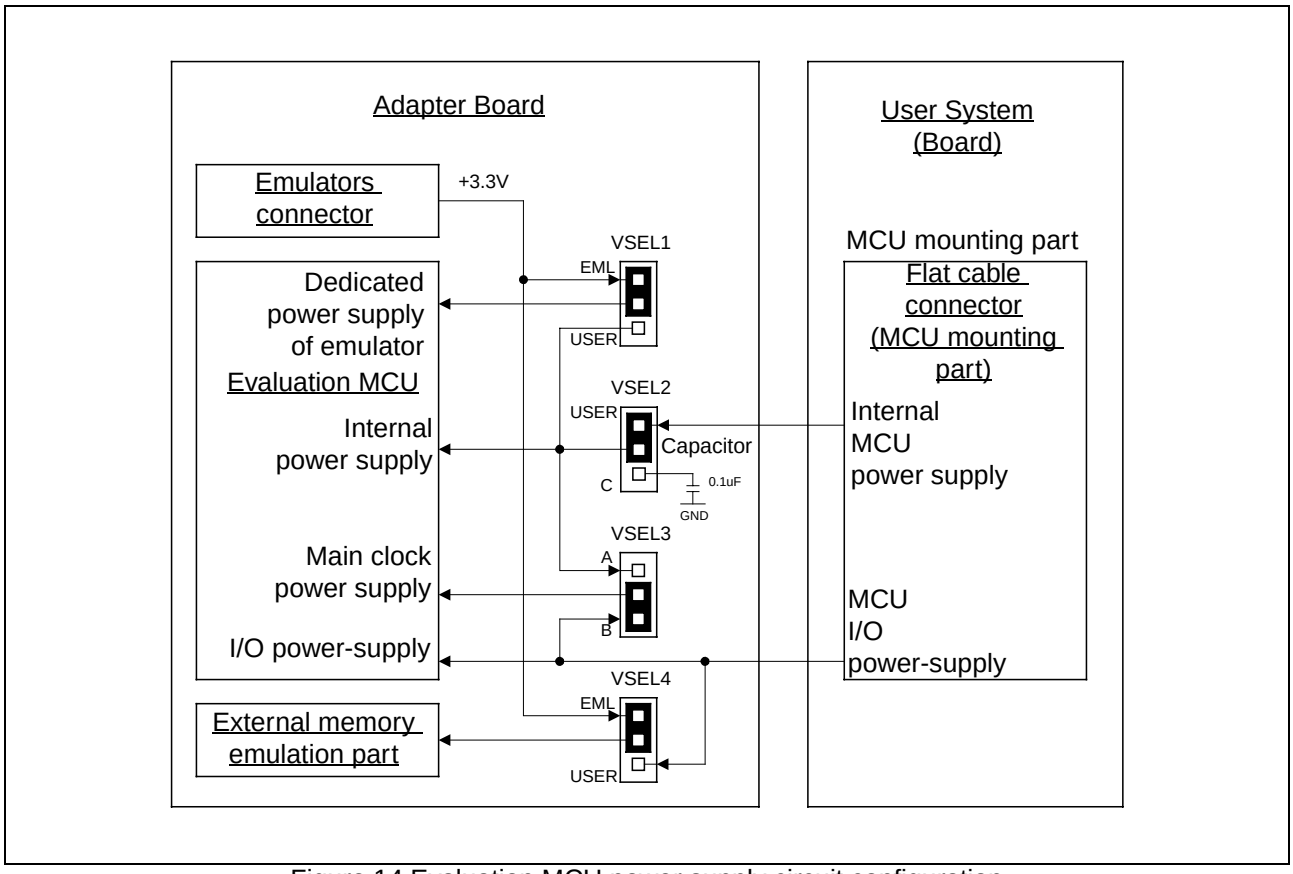


Figure 14 Evaluation MCU power supply circuit configuration

■ **Settings of evaluation MCU power supply setup jumper plugs (VSEL1 to VSEL4)**

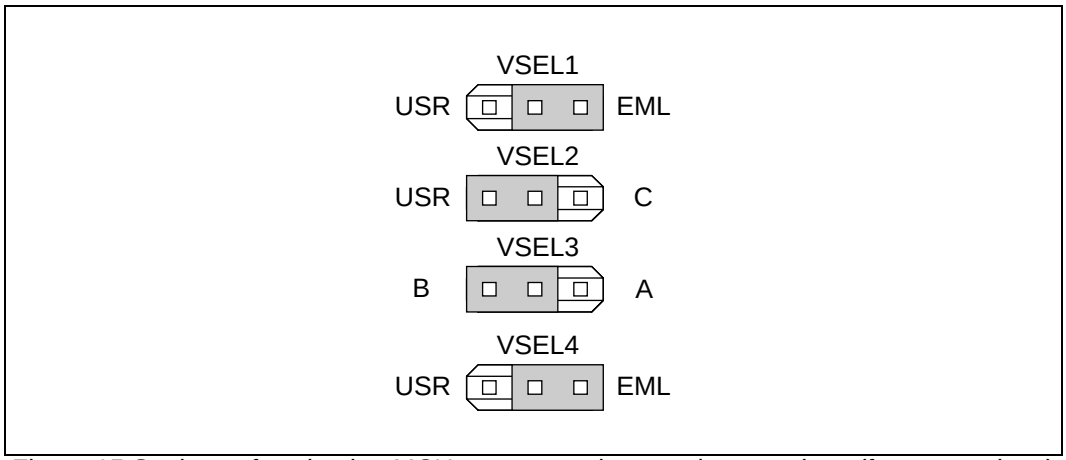


Figure 15 Settings of evaluation MCU power supply setup jumper plugs (factory settings)

Table 6 Jumper plug settings

Jumper plug name	Setting	Evaluation MCU power supply specifications
VSEL1	USR side	Supplies from the user system the dedicated power supply for emulator.
	EML side	Supplies the dedicated power supply for the emulator*1 from the emulator.
VSEL2	USR side	Supplies the user system power supply to the internal power supply of evaluation MCU.
	C side	Adds the capacitor (0.1µF) to the internal power supply of the evaluation MCU*2.
VSEL3	A side	Supplies the main clock power supply*3 from the internal power supply of evaluation MCU.
	B side	Supplies the main clock power supply*3 from the I/O power supply of evaluation MCU (B side fixed).
VSEL4	USR side	Supplies the back-up power supply*4 from the user system (evaluation MCU I/O power supply) using as RAM.
	EML side	Supplies from the emulator the back-up power supply*4 , using as ROM. Always use this setting when the external memory emulation function is not being used.

*1 : When using a power-on debugging function, it is necessary that the dedicated power supply for emulator should be supplied from an emulator (EML side), and the evaluation MCU should support the power-on debugging function. See the "Evaluation MCU hardware manual" or "datasheet", for information whether the evaluation MCU supports power-on debbugging function. Contact the sales or support representative if you are unsure.

*2 : For the specifications of the internal power supply of evaluation MCU, see the “Evaluation MCU hardware manual” or contact the sales or support representative if you are unsure.

*3 : Supply the I/O power supply of evaluation MCU to the main clock power supply.

*4 : The backup power supply is used for the external-memory emulation circuit on the adapter board.To use the data backup function, supply backup power from the emulator. In this case, the emulator detects the power-on or shutdown state of the user system to back up data on the adapter board (ROM equivalent operation).

6.2 Setting the Clock Supply Circuit

The clock peripheral circuit configuration to the evaluation MCU are shown in Figure 16, the installing method of oscillator in Figure 17, the factory default setting of clock selection jumper plug in Figure 18, and the correspondence between clock selection jumper plug and clock supply in Table 7.

■ Clock peripheral circuit configuration

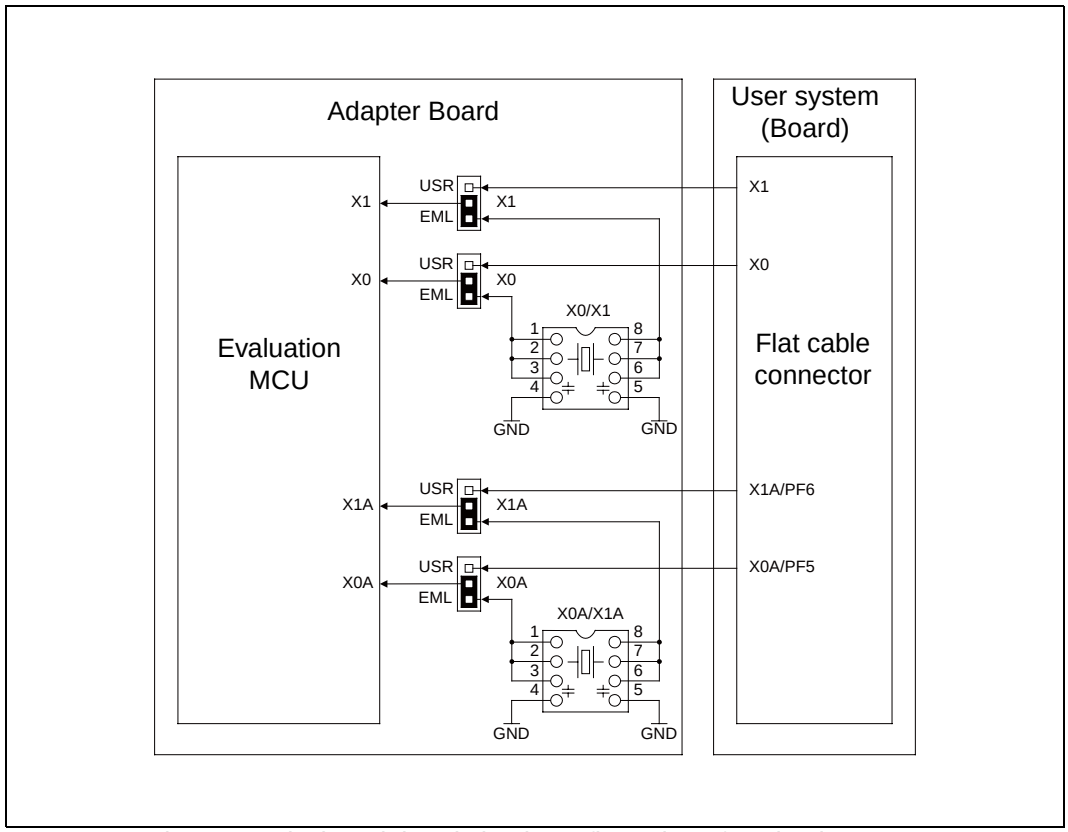


Figure 16 Clock peripheral circuit configuration of evaluation MCU

■ Installing the oscillator

Mount the oscillators and capacitors on the oscillator IC sockets (SC2, SC3) of the adapter board to supply the clock signal from the adapter board to the main clock (X0/X1) and to sub clock (X0A/X1A) of the evaluation MCU respectively.

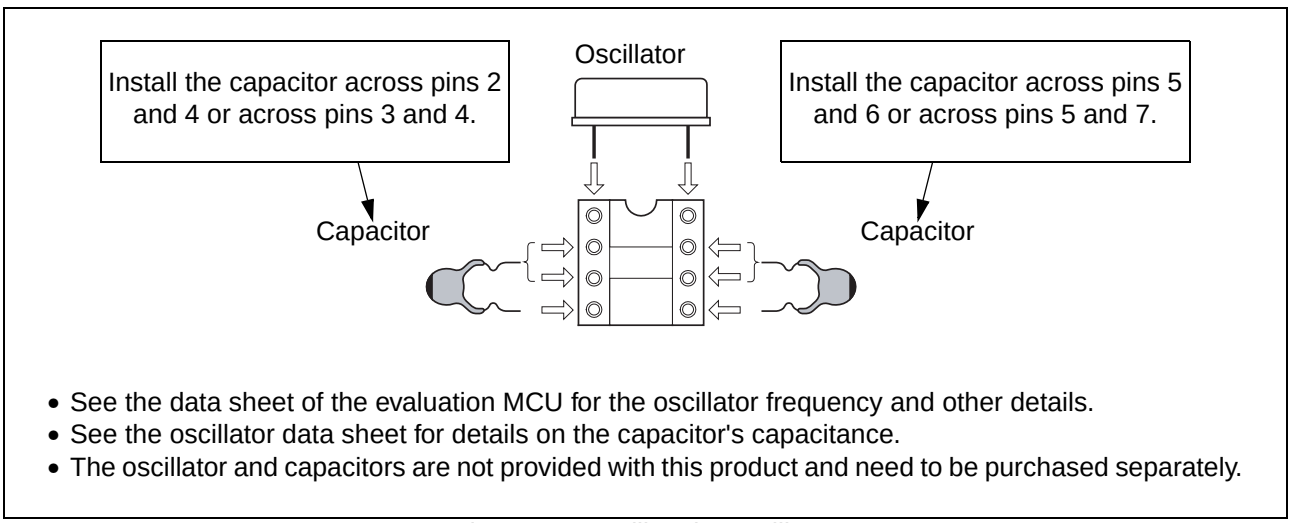

Install the capacitor across pins 2 and 4 or across pins 3 and 4.
Oscillator
Install the capacitor across pins 5 and 6 or across pins 5 and 7.
Capacitor
Capacitor
• See the data sheet of the evaluation MCU for the oscillator frequency and other details.
• See the oscillator data sheet for details on the capacitor's capacitance.
• The oscillator and capacitors are not provided with this product and need to be purchased separately.

Figure 17 Installing the oscillator

Note : For a cpacitor that is mounted with the oscillator, use a capacitor about 10pF smaller than the recommended value of the oscillator.
When a capacitor of the recommended value of the oscillator is mounted, an oscillator stabilization time becomes longer than the standard time due to the parasitic capacitance of a socket and the influence of an interconnect load and that may cause a failure such as instability of clock switching operation etc.

■ Clock selection jumper plugs

The factory settings of the jumper plugs are shown in Figure 18, and the correspondence between the clock selection jumper plugs and clock supply is shown in Table 7.

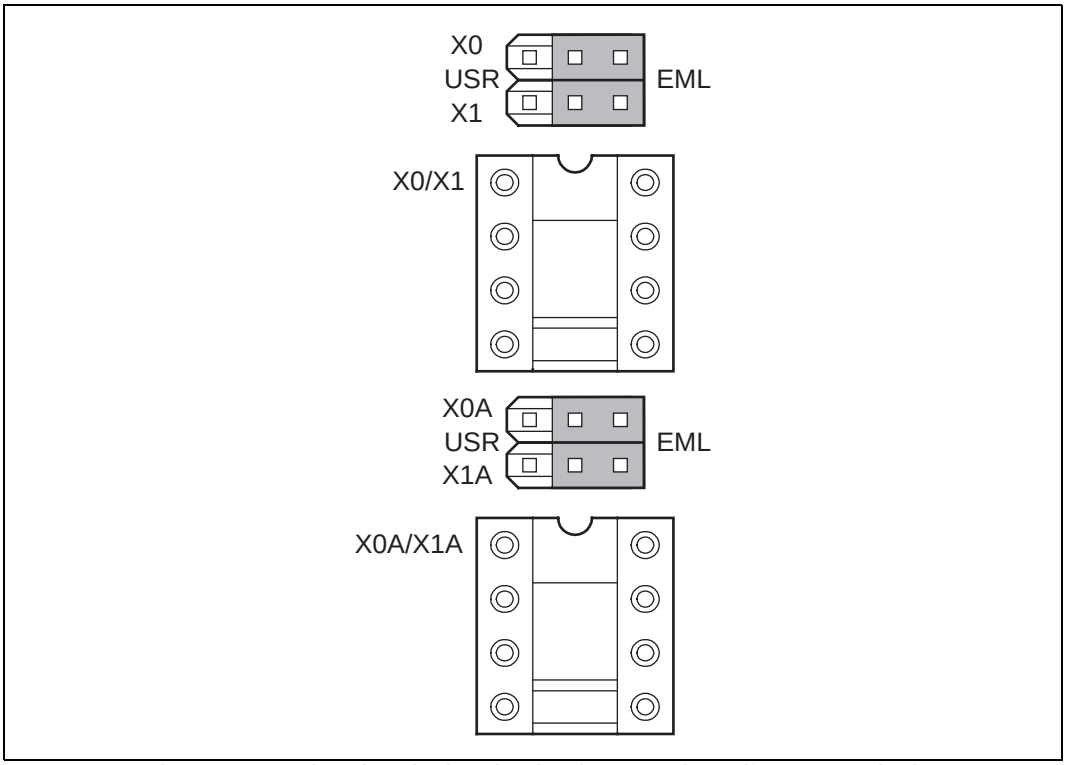


Figure 18 Setting the clock selection jumper plugs (factory setting)

Table 7 Jumper plug settings

Jumper plug name	Setting	Clock supply*
X0,X1	USR side	Supply main clock signal from user system.
	EML side	Supply main clock signal from oscillator IC socket on adapter.
X0A,X1A	EML side	Supply sub clock signal from oscillator IC socket on adapter (fixed on EML side).

* : There is no function to supply a clock signal from the adapter to the user system.

Note : To supply the main clock from the user system, create the oscillation circuit on the user system, buffer the main clock via the CMOS buffer or the like, and then supply it.
Since supplying the sub clock from the user system may result in instable operation, be sure to supply the sub clock from the adapter board.

6.3 Setting the Reset Signal

Supply the reset signals to the evaluation MCU by the user system and the emulator. Use the jumper plugs with the factory default settings.

■ Setting the reset signal

The factory default settings of the reset signal selection jumper plugs are shown in Figure 19.
Under the factory default settings, the INITX signal ($\overline{\text{INIT}}$) is supplied to the evaluation MCU from the INITX signal on the user system via the emulator, and the TRSTX signal ($\overline{\text{TRST}}$) is supplied to the evaluation MCU from the reset signal of the emulator.

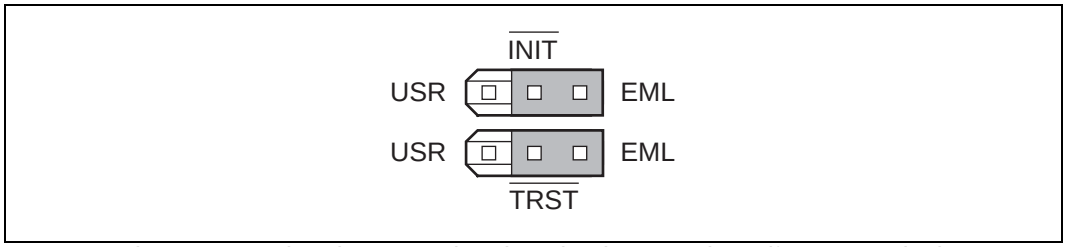


Figure 19 Setting the reset signal setting jumper plugs (factory setting)

6.4 Setting the External Memory Emulation

The external memory emulation block diagram is shown in Figure 20, the settings of the switch are shown in Figure 21 and the memory board sizes and valid addresses selected by the switches are shown in Table 8, the factory settings of the memory connection switches are shown in Figure 22, and the individual switches in each memory connection switch block and the corresponding signal lines and evaluation MCU pin numbers are shown in Table 9.

■ External memory emulation block diagram

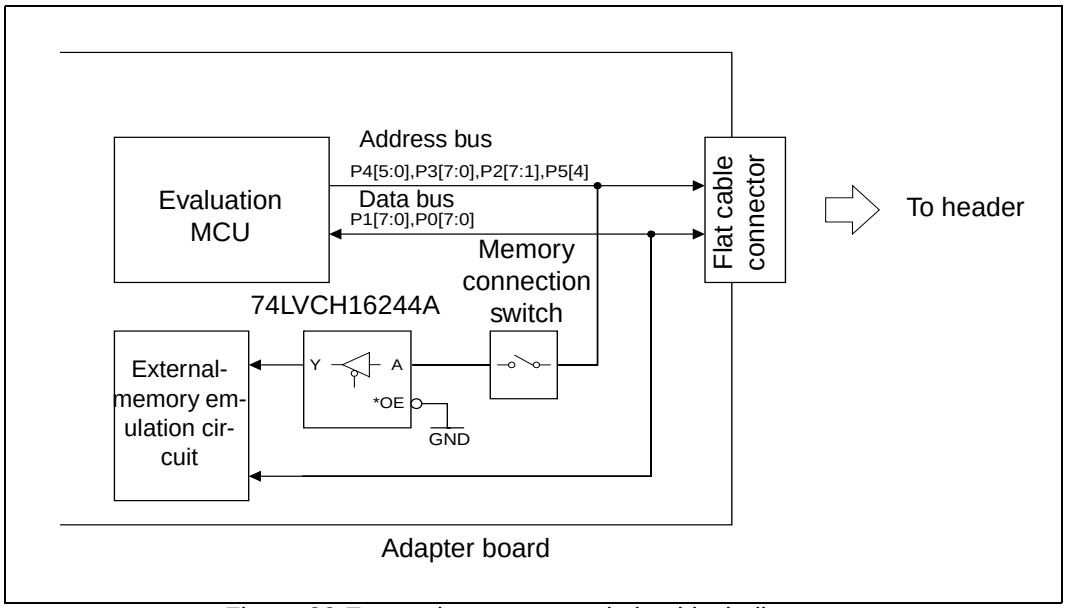


Figure 20 External memory emulation block diagram

■ Setting the memory size selection switch

The memory size selection switch select the size of the memory board to be connected when the external memory emulation function is being used.

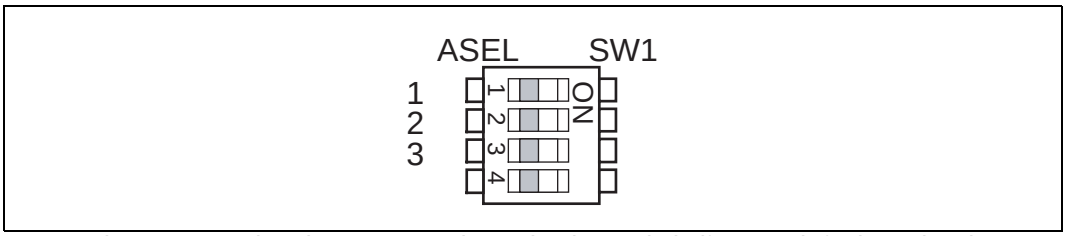


Figure 21 Setting the memory size selection switch (factory default settings)

Table 8 The memory size selection switch settings

ASEL3	ASEL2	ASEL1	Memory board size	Valid addresses
1	1	1	2 MWords	A[21:1]
1	1	0		
1	0	1	1 MWords	A[20:1]
1	0	0	512 KWords	A[19:1]
0	1	1	256 KWords	A[18:1]
0	1	0	128 KWords	A[17:1]
0	0	1	64 KWords	A[16:1]
0	0	0	32 KWords	A[15:1]

■ Setting the memory connection switches

When the external memory emulation function is used, the address lines that are disabled by the memory size selection setting can be disconnected from the buffers and used as user resources instead. Even when the external-memory emulation function is not used, the switches can be used to disconnect those address lines from buffers to reduce the load on the address lines used as user resources.

The factory default settings of the switches are shown in Figure 22 and the individual switches in each switch block and the corresponding signal lines and evaluation MCU pin numbers are shown in Table 9.

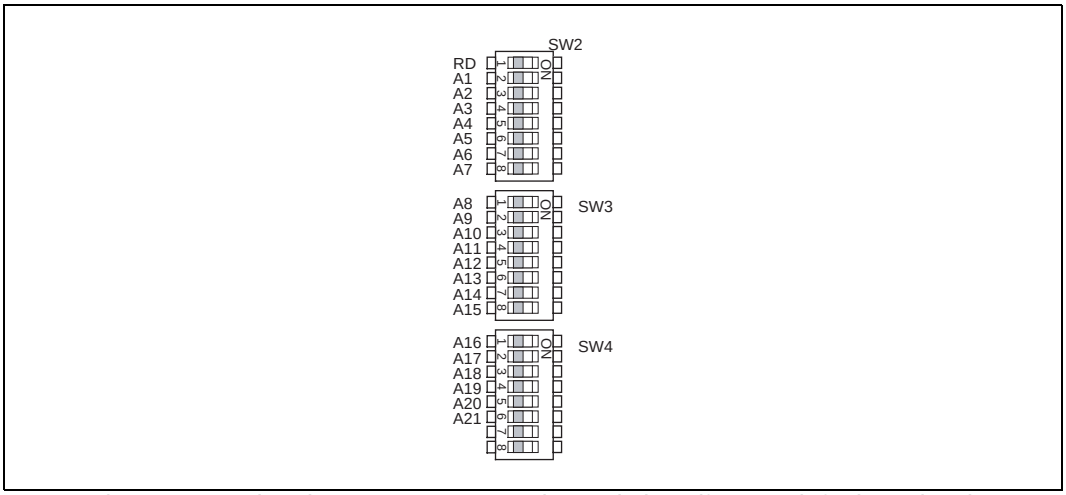


Figure 22 Setting the memory connection switches (factory default settings)

Table 9 The memory connection switch settings

Part number (Printed on board)	Element number (Labeled on switch)	Corresponding signal line*	Evaluation MCU's pin number*
SW2	1	P54 (RDX)	140
	2	P21 (A1)	310
	3	P22 (A2)	201
	4	P23 (A3)	357
	5	P24 (A4)	257
	6	P25 (A5)	144
	7	P26 (A6)	309
	8	P27 (A7)	256
SW3	1	P30 (A8)	200
	2	P31 (A9)	356
	3	P32 (A10)	308
	4	P33 (A11)	92
	5	P34 (A12)	44
	6	P35 (A13)	255
	7	P36 (A14)	143
	8	P37 (A15)	199
SW4	1	P40 (A16)	307
	2	P41 (A17)	91
	3	P42 (A18)	142
	4	P43 (A19)	254
	5	P44 (A20)	43
	6	P45 (A21)	198

* : The user resources corresponding to the above pin numbers are different depending on the evaluation MCU used.
For details, see the hardware manual for the evaluation MCU to be used or “8. User Interface”.

6.5 Power-on/Shutdown Procedures

Turn the power on after completing all of the connections in the sequence: host computer → emulator → user system.
Turn the power off in the sequence: user system → emulator → host computer.

■ Power-on procedure

Turn the power on using the sequence shown in Figure 23 after completing all of the connections.
The emulator power is turned on by pressing the power switch on the rear of the emulator. The power switch remains depressed when pressed.
See the operation manual of the emulator for details on the position of the power switch.

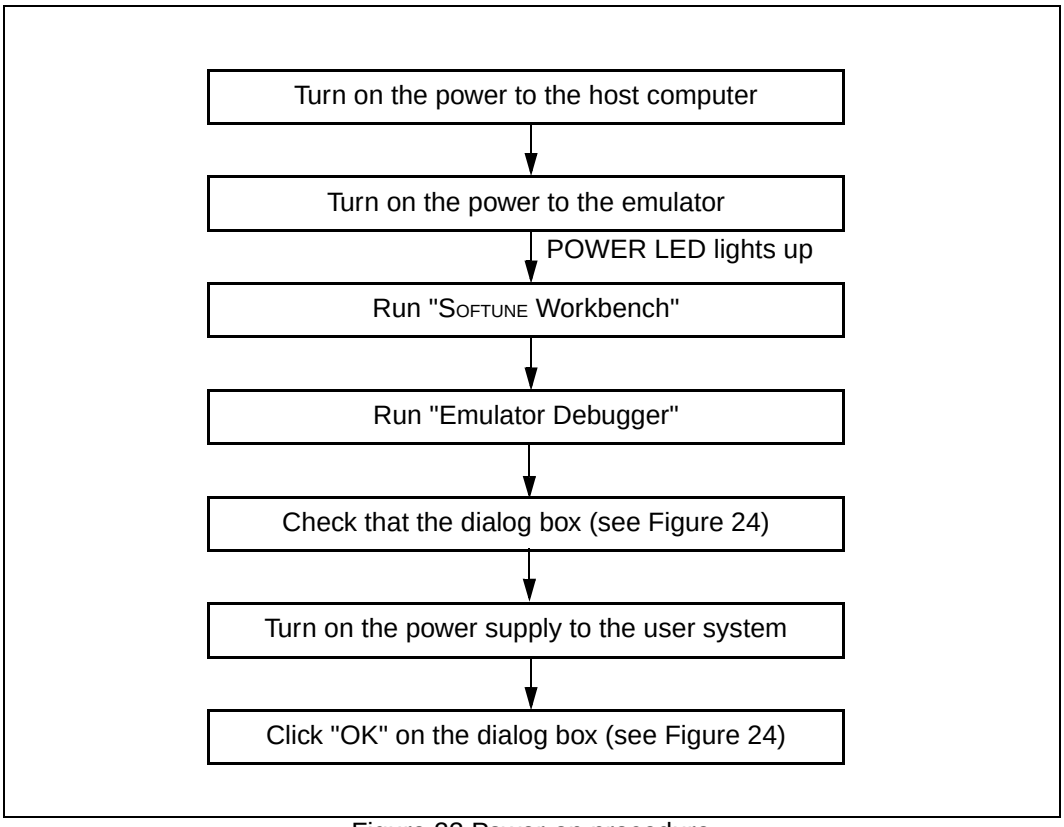

Turn on the power to the host computer
Turn on the power to the emulator
POWER LED lights up
Run "SOFTUNE Workbench"
Run "Emulator Debugger"
Check that the dialog box (see Figure 24)
Turn on the power supply to the user system
Click "OK" on the dialog box (see Figure 24)

Figure 23 Power-on procedure

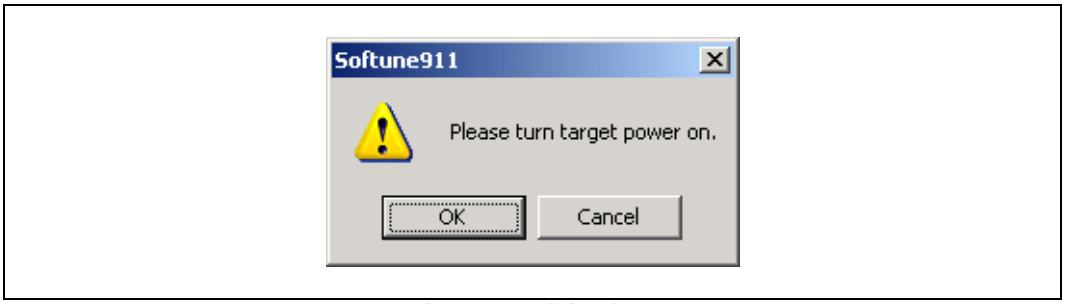


Figure 24 Dialog box

■ Power-off procedure

Turn the power off using the sequence shown in Figure 25.
Turn off the power supply to the emulator by pressing the switch on the rear of the emulator and releasing your finger. The switch then returns to the off state with the switch protruding.
See the operation manual of the emulator for details on the position of the power switch.

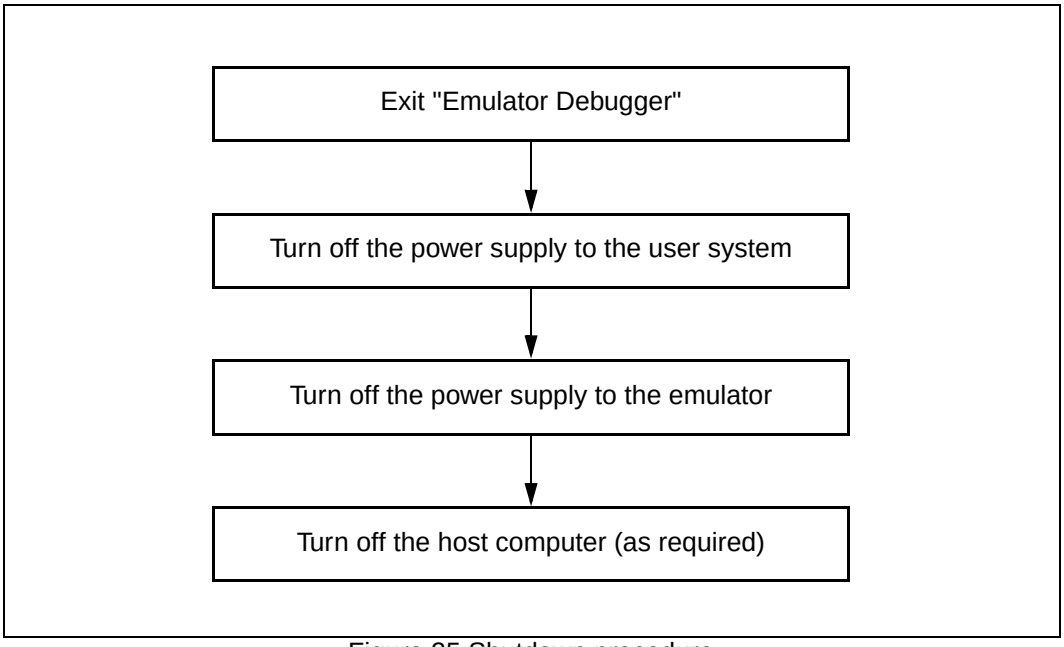

Exit "Emulator Debugger"
Turn off the power supply to the user system
Turn off the power supply to the emulator
Turn off the host computer (as required)

Figure 25 Shutdown procedure

7. Cautions

■ General cautions on the adapter

- Disconnect all of the power supplies from the adapter, emulator, and user system before setting any jumper plugs or switches on the adapter board.
- The settings of jumper plugs VSEL1 to VSEL4 are related to the power supply. Setting these jumper plugs incorrectly may destroy the entire system.
- When a clock signal is supplied ti the evaluation MCU from the user system, the wiring pattern from the clock signal source on the user system side may be too long to provide oscillation.
- If it is instructed that the X0 or X1 pin should be opened as restricted to the evaluation MCU when a clock signal is being supplied from the user system to the evaluation MCU using an oscillator, remove the jumper plug for switching the clock signal supply source on the specified side. This is also applicable to X0A/X1A pin.
- When using the emulator, set the reset signal jumper plug which selects the control source of the INITX pin of the evaluation MCU to the EML side. When the emulator is being used, the emulator controls the INITX pin of the evaluation MCU, and the reset input from the user system is not connected directly to the evaluation MCU, but is routed via the emulator. The reset timing is therefore delayed by several clock cycles compared to the actual reset timing.
  Furthermore, when a reset is performed using the emulator reset command, only the evaluation MCU is reset, and the user system is not reset.
  In addition, the signal to the INITX pin from the user system is masked by the emulator during a break.
- The states of the user bus pins when the evaluation MCU is in user hold or low power consumption modes are the same as the states shown in the MCU hardware manual.
- The “flat cable (long)” can be used if the MCU’s clock frequency is low or the load of the user pin is very low. Basically, use the “flat cable (standard)”.
- If using the adapter and the header, always make sure that the MCU on the user system is socket-mounted to be removed, Use the specified IC socket for the MCU socket.
- Power is not supplied from the adapter, header, or emulator to the user system.
- When the external memory emulation function is not used, set all the memory connection switches to OFF. If external signals are applied with the memory connection switches set to ON, drive the adapter at a current of at least ±750µA. If the drive current is lower than ±750µA, a normal potential may not be obtained due to the bus hold feature of the buffer IC.

■ Cautions when using the external memory emulation function

- When using the external memory emulation function, set the memory connection switches to ON that correspond to the valid address bus signals (equivalent to A[21:1] depending on the memory size settings) and the control lines (equivalent to RDX).
- A buffer IC is connected to the valid address bus signals (which vary depending on the memory size setting) and control lines used for external memory emulation. A capacitance of about 6pF is therefore added to each of the signal conductors.
- As a buffer IC is connected to the valid address bus signals and control lines used for external memory emulation, each signal conductor connected to the memory board involves a delay of about 6ns.
- As the data bus used for external memory emulation is connected directly to the data bus signal (equivalent to D[31:16]), the external I/O power supply to the evaluation MCU must always be within +3.3V. If the external I/O power supply exceeds +3.3V, the memory board may be damaged.
- As the data bus used for external-memory emulation is connected directly to the data bus of the evaluation MCU, a capacitance of about 6pF is added to each signal conductor when the memory board is installed.
- The data bus used for external-memory emulation is fixed at 16 bits in width.
- Although some of the address bus signals, data bus signals, and control lines of the memory board are connected to the user system, the chip select signal is not connected and thus the user system cannot access data in the memory board.

■ Cautions when using the power-on debug function

- When performing power-on debugging, pay due attention to the settings related to power supply.
- The following three conditions must be satisfied when the power supply is turned off by power-on debugging:

    1. It takes 25μs or more for all the power supply levels of the evaluation MCU to decrease from 0.9Vcc to 0.5Vcc.
    2. The CPU operating frequency is 1MHz or higher.
    3. A user program is being executed.

- For details on the power-on debug function, see the emulator operation manual.

■ Cautions when using the external memory emulation function and the power-on debug function

If the user power supply is shut off with the external address and RDX pins remaining high level, the bus hold feature of the buffer ICs on the adapter board causes a current of up to 250μA to flow until each signal level goes low.

8. User Interface

■ User Interface Specifications

The correspondence between the pin numbers of flat cable connectors A and B on the adapter board and those on the header or user system are shown in Figure 26, and the correspondence between the pin numbers of flat cable connectors A and B and the evaluation MCU is shown in Table 10 and Table 11.

Note that the evaluation MCU signal names in the table are provisional names and the actual signal names vary with each model. The actual evaluation MCU signal names can be judged from the evaluation MCU pin numbers. If you are unsure of the details, contact the sales or support representative.

The following notation and warnings apply to each of the evaluation MCU signal names.

- Vcc_A : Internal power supply of the evaluation MCU (or the C pin).
- Vcc_B : I/O power supply of the evaluation MCU (or a single power supply).
- VCCXTL : Main clock power supply of the evaluation MCU.
- GND : Ground of the evaluation MCU.

Note : The pins that are identified by the underlined evaluation MCU signal names in the table may have additional circuitry attached for controlling the evaluation MCU. As a result, the electrical characteristics of these pins may differ from an actual MCU.

See the sections listed below for details on the additional circuit for each signal.

- P65/P85/PD3/PF2 (DVcc) : See Section 5.3 "Installing a Bypass Capacitor for DVCC"
- X0/X1 : See Section 6.2 "Setting the Clock Supply Circuit"
- X0A/X1A (PF5/PF6) : See Section 6.2 "Setting the Clock Supply Circuit"
- P54 (RDX) : See Section 6.4 "Setting the External Memory Emulation"

  P4[5:0] (A[21:16])
  P3[7:0] (A[15:8])
  P2[7:1] (A[7:1])
  P1[7:0] (D[15:8])
  P0[7:0] (D[7:0])

The emulator uses Vcc_A and Vcc_B mainly as the power supplies to the evaluation MCU and additionally for voltage detection purposes only; it does not contain circuit consuming large power.

It is recommended to use the “flat cable (standard)” bundled with the emulator to prevent noise trouble. Provide the user system with a connector equivalent to the flat cable connector. The part number of the flat cable connector is as follows:

- Flat cable connector part number: 8930E-100-178MS-F (manufactured by KEL)

Note that the pinouts of flat cable connectors A and B are different between the adapter board and the user system.

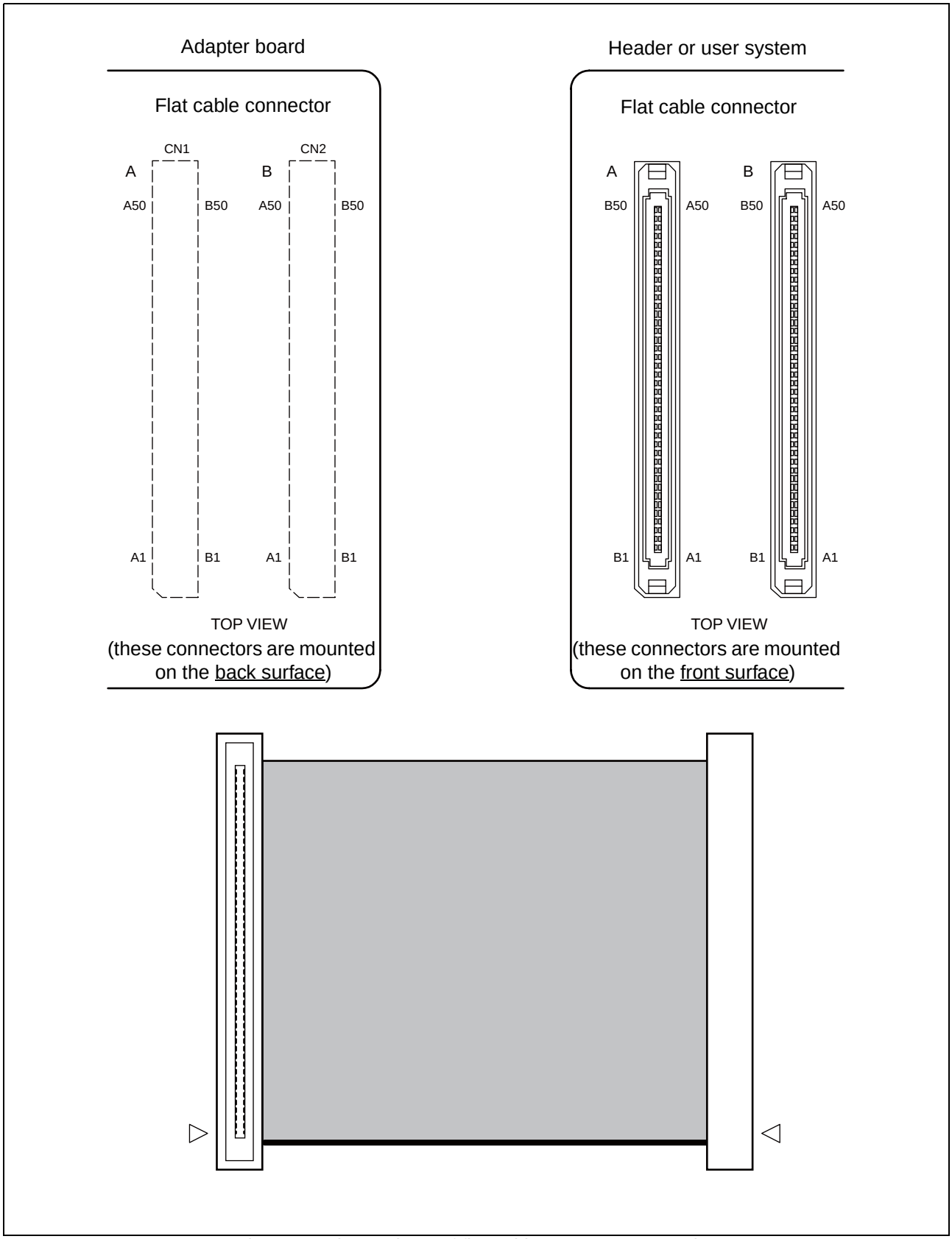


Figure 26 Pin numbers of flat cable connectors A and B

Table 10 Pinouts of flat cable connector A

Connector pin number	Evaluation MCU signal name (provisional name)*	Evaluation MCU pin number	Connector pin number	Evaluation MCU signal name (provisional name)*	Evaluation MCU pin number
A1	GND	–	B1	GND	–
A2	P91	135	B2	P92	84
A3	P93	301	B3	P94	192
A4	P95	191	B4	P96	35
A5	P97	349	B5	AVCC	131
A6	AVRH	296	B6	AVRL	242
A7	AVSS	186	B7	PC0	245
A8	PC1	188	B8	PC2	297
A9	PC3	244	B9	PC4	346
A10	PC5	187	B10	PC6	345
A11	PC7	243	B11	GND	–
A12	PA0	83	B12	PA1	300
A13	Vcc_A	–	B13	PA2	248
A14	P87	249	B14	P90	193
A15	GND	–	B15	P86	85
A16	P84	302	B16	P85 (DVcc)	36
A17	P82	136	B17	P83	303
A18	P80	37	B18	P81	86
A19	P77	138	B19	GND	–
A20	P75	250	B20	P76	351
A21	P73	195	B21	P74	137
A22	P71	38	B22	P72	194
A23	GND	–	B23	Vcc_A	–
A24	VCC3B	5	B24	P70	87
A25	X0A/PF5	209	B25	X1A/PF6	51
A26	P66	252	B26	P67	251
A27	P65 (DVcc)	39	B27	GND	–
A28	P63	40	B28	P64	304
A29	P61	139	B29	P62	88
A30	P57	41	B30	P60	305
A31	GND	–	B31	P56	89
A32	P54 (RDX)	140	B32	P55	196
A33	P52	42	B33	P53	253
A34	P51	306	B34	Vcc_A	–
A35	P50	197	B35	GND	–
A36	P46	141	B36	P47	90
A37	VCCXTL	76	B37	P20	202
A38	P21 (A1)	310	B38	P22 (A2)	201
A39	GND	–	B39	P23 (A3)	357
A40	P24 (A4)	257	B40	P25 (A5)	144
A41	P26 (A6)	309	B41	P27 (A7)	256
A42	P30 (A8)	200	B42	P31 (A9)	356
A43	P32 (A10)	308	B43	GND	–
A44	P33 (A11)	92	B44	P34 (A12)	44
A45	P35 (A13)	255	B45	P36 (A14)	143
A46	P37 (A15)	199	B46	P40 (A16)	307
A47	P41 (A17)	91	B47	Vcc_A	–
A48	P43 (A19)	254	B48	P42 (A18)	142
A49	P45 (A21)	198	B49	P44 (A20)	43
A50	GND	–	B50	GND	–

* : Note that the MCU signal names listed in the table are provisional names, and the actual signal names vary depending on the model.

Table 11 Pinouts of flat cable connector B

Connector pin number	Evaluation MCU signal name (provisional name)*	Evaluation MCU pin number	Connector pin number	Evaluation MCU signal name (provisional name)*	Evaluation MCU pin number
A1	GND	–	B1	GND	–
A2	–	–	B2	PG5	50
A3	PG4	4	B3	PG3	315
A4	PG2	208	B4	PG1	98
A5	PG0	153	B5	PF3	182
A6	PF2 (DVcc)	127	B6	PF1	239
A7	GND	–	B7	PF0	31
A8	PE7	293	B8	PE6	183
A9	PE5	78	B9	PE4	128
A10	PE3	184	B10	PE2	32
A11	PE1	240	B11	GND	–
A12	PE0	129	B12	PD7	79
A13	PD6	294	B13	PD5	185
A14	PD4	130	B14	PD3 (DVcc)	241
A15	GND	–	B15	PG6	97
A16	PD2	80	B16	PD1	295
A17	Vcc_B	–	B17	PD0	344
A18	PB7	298	B18	PB6	132
A19	PB5	189	B19	GND	–
A20	PB4	246	B20	PB3	348
A21	PB2	299	B21	PB1	133
A22	PB0	81	B22	VCC3IO	33
A23	GND	–	B23	PA7	247
A24	PA6	190	B24	PA5	34
A25	PA4	134	B25	PA3	82
A26	Vcc_B	–	B26	X0	29
A27	X1	291	B27	GND	–
A28	P17 (D15)	258	B28	P16 (D14)	146
A29	P15 (D13)	203	B29	P14 (D12)	259
A30	P13 (D11)	93	B30	P12 (D10)	147
A31	GND	–	B31	P11 (D9)	204
A32	P10 (D8)	312	B32	P07 (D7)	260
A33	P06 (D6)	94	B33	P05 (D5)	45
A34	P04 (D4)	205	B34	P03 (D3)	148
A35	P02 (D2)	1	B35	GND	–
A36	Vcc_B	–	B36	P01 (D1)	95
A37	P00 (D0)	46	B37	INITX	126
A38	MOD0	292	B38	MOD1	30
A39	GND	–	B39	MOD2	77
A40	PI7	206	B40	PI6	261
A41	PI5	47	B41	PI4	313
A42	PI3	2	B42	PI2	149
A43	PI1	150	B43	GND	–
A44	PI0	262	B44	PH7	48
A45	PH6	96	B45	PH5	151
A46	PH4	207	B46	PH3	49
A47	GND	–	B47	PH2	3
A48	PH1	263	B48	Vcc_B	–
A49	PH0	264	B49	–	–
A50	GND	–	B50	GND	–

* : Note that the MCU signal names listed in the table are provisional names, and the actual signal names vary depending on the model.

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FUJITSU MICROELECTRONICS • SUPPORT SYSYEM

DSU-FR EMULATOR
PGA-401P ADAPTER TYPE 2
MB2198-130-E
OPERATION MANUAL

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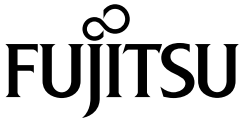
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